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PERMANENT ADDRESS:

12 Monck Square
CFB Petawawa, Ontario
K8H 2T9

DATED September 6 1979

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FEASIBILITY OF A DRUG INFORMATION SERVICE FOR A CANADIAN FORCES BASE HOSPITAL

by

GILBERT LAWRENCE HARTLEY COWLEY

A THESIS
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DEPARTMENT OF CLINICAL PHARMACY

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "FEASIBILITY OF A DRUG INFORMATION SERVICE FOR A CANADIAN FORCES BASE HOSPITAL" submitted by Gilbert Lawrence Hartley Cowley in partial fulfilment of the requirements for the degree of Master of Pharmacy.

....
Supervisor

....

....

C B Hazlett
....

DATE Sept 6, 1979

ABSTRACT

Many medical centres in North America have introduced the drug information service (DIS) concept as a method of organizing and disseminating the vast quantities of drug information (DI) now challenging the health care community. While several studies have been published regarding the establishment of a DIS in large medical centres, none are available relating a DIS to a small Canadian Forces Base (CFB) hospital. A project was undertaken to ascertain the feasibility of establishing a DIS in a small CFB hospital, and to evaluate the short term impact of such a service. Evaluation of the DIS consisted of analysis of DI activity in relation to changes in frequency and nature of DI questions. The sample groups for this study consisted of all nurses and physicians at the base hospital CFB Calgary and CFB Edmonton who were designated as the control and experimental groups respectively. Instruments utilized included a DI questionnaire and a DI documentation sheet. The successful implementation and operation of DIS was reflected in an increase in DIS utilization. There was a significant change in opinion by the experimental combined group in the frequency with which they would utilize the pharmacist as a DI source, which suggested support of DIS through utilization. Significant changes occurred in both the frequency and nature of drug information questions received. Limitations of this study included the nature of the experimental design, the lack of sampling equivalence between sample groups, the small sample sizes, and the brevity of the study. Recommendations from this project include suggestions for two additional studies, one involving several closely

matched hospitals to further assess viability of a DIS for all CFB hospitals and another study by the base hospital pharmacist to determine the implication of an increased DI role in relation to current pharmacy responsibilities.

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CHAPTER I

INTRODUCTION

Statement and Importance of the Problem

Drug information (DI) may be broadly defined as "knowledge of facts or circumstances acquired through reading, study or practical experience. It may concern any chemical substance included for use in diagnosis, prevention, treatment or cure of disease, or to otherwise enhance the physical or mental well-being of men or animals" (Riley, 1973).

Historically, the provision of drug information has been considered an integral part of the pharmacist's role (de Haen, 1971). This role became diminished with the advent of pharmaceutical manufacturers in the 19th century, which established a direct line to the physician, thus breaking the direct contact of the prescription pharmacist and physician. As the ancient functions of compounding and dispensing decreased, the pharmacist became largely regarded as a storeman (de Haen, 1971).

The new chemical drugs developed in the late 19th century and the first 35 years of the 20th century did not create any apparent need for a formalized system of drug information. The physicians relied to a major degree on acting as their own interpreters in correlating drug literature with their clinical experience (Keefer, 1966). With the avalanche of new drugs in the 1940's and 1950's, the problems of adverse drug effects, drug interactions, identification of the drug

of choice and interpreting drug literature became more significant (de Haen, 1971; Briggs and Smith, 1974).

The proliferation of scientific literature generated by increased research in the 1960's and 1970's has resulted in a problem that has challenged the health team in remaining current with the growing knowledge regarding drugs, their rational use and toxic hazards (Franke, 1970). The need for the organization and centralization of this information, along with a method of coordinating and disseminating it, provided the opportunity for the pharmacist to again play a major role in solving the physician's drug information dilemma (Burkholder, 1965).

Pharmacists have developed the Drug Information Service (DIS) concept in numerous medical centers in North America (Anderson & Latiolais, 1965; Parker, 1965), however, the provision of a DIS in small Canadian Forces Base (CFB) hospitals has not been examined.

CFB hospitals are traditionally staffed by junior health care officers who are usually recent university graduates. Their limited work experience combined with a large outpatient care workload suggests a need for considerable drug information. At present this need is being met on an individual basis by intercolleague contact, written publications (e.g., journals, textbooks), and to a very limited extent by the pharmacy service.

The current role of the pharmacy service in a CFB hospital is primarily one of medical supply and providing an outpatient prescription service. In carrying out this service, the pharmacist is assisted by a pharmacy supply technician and has access to a limited library and fiscal resources. However, high interprofessional communication

provides an opportunity for the pharmacist to increase his drug information role through the development of a drug information service.

Purpose of the Study

The vast increase in knowledge of drugs and their uses has created a drug information (DI) dilemma in small Canadian Forces Base (CFB) hospitals. The base hospital pharmacist may thus have an opportunity to expand his drug information role through the development of a relevant drug information service which can meet this need.

The purpose of this study was to: ascertain the feasibility of establishing a drug information service in a local CFB hospital; and to evaluate the short term impact of such a service. It was known *a priori* that the limited time and resources of the investigator, and the constraints of field conditions (e.g., lack of sufficient number of subjects) would preclude generalization of the study results. The justification of the study must be viewed in terms of a demonstration project: the clear need to demonstrate the feasibility of implementing a DIS in the context of a CFB hospital setting.

Limitations of the Study

This study contained severe limitations including the nature of the experimental design and groups used. A major drawback was the

brevity of the study, which limited the quantity of data collected thereby limiting the degrees of freedom and level of confidence obtained. The lack of randomization in the selection and assignment of the control and experimental groups (i.e. base hospitals, and the participants within each group), prevented assurance of prior equivalent comparative groups. Also lack of randomization and the fact that only one control and one experimental hospital were used prevents the generalization of results to other CFB hospitals; at best, generalizations should be restricted to future personnel within the two hospitals studied. The small numbers of personnel which were studied in each hospital meant that statistically nonsignificant findings were likely, (i.e., there could have been a difference but the study could not detect it). Further, the control and experimental personnel were not necessarily comparable prior to implementation of the study; there were notable differences in the age, experience levels, and nature of employment between the groups. The control physicians were generally older and more experienced, and therefore could have the potential of a greater awareness of and bias against the value of a drug information service. In contrast, the experimental physicians were younger recent university graduates, with limited drug information service experience, and must be considered in relation to their greater potential for change in both attitude and practice. Regarding employment, a major portion of the control physicians' practice consisted of working independently away from the hospital environment. During the interval between the period one and period two testing, these physicians

were away participating in an eight week military field exercise. The experimental physicians however, practiced continuously as a group in the base hospital setting. During the study period, there was only one nurse available at the control hospital and she had limited opportunity to become involved in drug information. There were seven nurses at the experimental hospital who were generally more experienced and whose job environment provided a greater opportunity to require drug information.

Further, the unpredictable circumstance of a major military exercise beginning shortly after the study began, nullified the use of base hospital CFB Calgary as a control group for comparison of DI activity. The DIS could only be implemented and assessed in one particular base hospital setting, therefore the results were generally restricted to that particular base hospital and group involved.

The military rank and status of the investigator as a senior military pharmacist might have introduced an experimental effect - negatively or positively. Attempts to minimize this influence could only be moderately successful due to the small size of the base hospital and close contact between staff and the DIS pharmacist. Regardless of rank and status of the DIS pharmacist in this study, it remains that the influence of only one pharmacist was studied, thus precluding any generalization beyond him.

Special Definitions

Specific terms and abbreviations which may be peculiar to the study are listed below.

ADR's - Adverse Drug Reactions
CFB - Canadian Forces Base
Combined - refers to all physicians and nurses at a CFB hospital
DI - Drug Information
DIS - Drug Information Service
Med. A. - Medical Assistant
M.O. - Medical officer (physician)
Pharm. - Pharmacist (the regular base hospital pharmacist)
S.E. - Side Effects

Overview of Thesis

In the following chapter literature related to the development of drug information services is reviewed. In chapters III and IV methodology, results and data analysis are presented in relation to the organization and evaluation of a DIS. The final chapter consists of a summary of the study and recommendations.

CHAPTER II

REVIEW OF RELEVANT LITERATURE

The literature reviewed focuses on two areas of drug information services, namely: historical development and the state of drug information services today.

Historical Development

The vast increases in scientific literature published in the past two decades and the resultant growth in knowledge of drugs and their use has placed increasing pressures on the health care team in their efforts to remain current (Burkholder, 1965). Numerous pharmacists responded to this need for a system of organizing and disseminating drug information. This response has progressed to the evolvement of systematized provision of drug information as evidenced by the development of DIS programs in a variety of health care settings in Canada, United States and Europe.

The initial efforts of pharmacists in the early sixties took the form of drug information centres in a few major teaching hospitals which utilized sophisticated retrieval systems and were manned by highly trained personnel (Parker, 1965; Anderson & Latiolais, 1965; Sister Mary, 1966; Schroeder, 1971). These drug information centres were also active in: providing background drug information to Pharmacy

and Therapeutics Committees; reporting adverse drug reactions (ADR's); and teaching health professionals (Schroeder, 1971; Patterson, 1973).

The trend to regional drug information services has evolved in an effort to broaden the scope of contact and provide service to those outside the university community (Durant & Zilz, 1967; Amerson & Walton, 1971; Pearson _et al_., 1972; Schroeder, 1975; Salter, 1975; Blackburn _et al_., 1976). Some of these centers operate through a series of community-hospital sub-centers, while others utilize a direct dial toll free telephone access. Some have incorporated a medical library of tapes containing a wide range of medical topics and a poison information component. The regionalized drug information network offers the unification of the many services available along with wide utilization. As such, it is an efficient and economical method of drug information delivery. Other authors have described the shared drug information service concept (Bachynsky, 1972; Burkholder, 1973; Pearson, 1974). This involves the sharing of a drug information service, the costs and staffing by several community hospitals in an area.

Consequently, various authors have described community drug information services in local hospitals (O'Brien & Edwards, 1971; Rosenberg & Peritore, 1971; DiPirro _et al_., 1975). Pellegrino (1965) refers to the local hospital drug information service as having immediate impact on the therapeutic activities of the majority of the country's physicians.

The early DIS, operated as part of the centralized pharmacy service, had a more passive than active role. Responses to drug queries about patients were made without benefit of the patient's clinical status.

Burkholder (1974) reported " ...an under-utilization of this service due to the pharmacist's lack of direct availability. He simply lacked visibility where he was needed, e.g. in areas of direct patient care where drug related problems were occurring [p. 102]". This led to the eventual decentralization of pharmacy services and the emergence of clinical pharmacists - pharmacists who could provide drug information which was patient-specific, by direct verbal exchange with physicians in patient care areas (Burkholder, 1967; Dantow & Gerald, 1968; Owyang et al., 1968; Rosenberg & Hanan, 1969; Smith, 1970; Hutchinson & Burkholder, 1971; O'Byrne, 1971; Hull III & Eckel, 1973). The pharmacist's presence in the clinical area also gave him opportunity to play a greater role in drug interaction surveillance and adverse drug reporting (Arnold, 1972).

As the scope of drug information activity expanded under the banner of clinical pharmacy more specialized modes of delivery evolved. Several authors describe the use of drug notes or medication reference sheets - 'Med-Ref' - to provide drug information direct to ward nurses and outpatients (Prisco & Plein, 1969; Weissman, 1972; Trice et al., 1972). Jacobs (1970) refers to data charts developed to aid ward nurses in correct preparation or injections and infusions and their storage. Another study proposed the provision of drug information via television, to obviate the need to leave the patient care area (Nelson et al., 1976). Other studies describe the provision of drug information on investigational drugs (Stephen & McKinley, 1974), consultation services to community nurses (Cardoni et al., 1974; White & Godwin, 1974), drug use reviews (Edwards et al., 1972; Knapp et al., 1973),

and the effects of patient counselling on patient compliance (Sharp & Mikeal, 1974).

Concurrently, specialized drug literature retrieval systems have also evolved to categorize material and facilitate retrieval. Professional organizations developed the American hospital formulary and drug compendia. Various abstracting services such as International Pharmaceutical Abstracts and Inpharma also appeared (Oddis, 1966; Seim & Kabat, 1966; Abramowicz, 1976). Other authors report the use of index cards and filing systems for drug information retrieval (Ferguson, 1967; Haavik & Lemberger, 1971). The most notable of the index card systems is de Haen's, which has now expanded to include seven major categories of drug information (de Haen, 1966). The Iowa Drug Information Service supplies complete drug literature articles via a microfilm file (Tester & Oleson, 1971).

The application of computer technology has become increasingly important in the storage, retrieval and dissemination of drug information (Conrad, 1966; Weston, 1967; Hayne, 1968). Many individual reports on use of computers to handle specific types of drug information have been published (Parks, 1970; Edwards et al., 1972; Allen & Greenblatt, 1975).

It is apparent from the literature that the DIS concept has evolved over the years to where many variations in the method of providing a DIS now exist. In the following section, the current state of drug information services will be reviewed.

The State of Drug Information Services Today

While the benefits and acceptance of drug information activity is established by numerous role models, the profession as a whole has not met the information needs of the health care system. Millis states in the report of the Study Commission on Pharmacy " ...that when pharmacy is viewed as a knowledge system, . . . it must be adjudged as neither effective nor efficient in delivering its knowledge to those who prescribe, dispense and consume drugs" (Millis, 1976). This deficiency has undoubtedly resulted in inappropriate drug use and an unacceptable frequency of drug-induced disease (Millis, 1976; Rosenberg & Kirschenbaum, 1976).

A survey published by the Food and Drug Administration in the United States on physicians' sources of drug information showed that pharmacists followed peer colleagues, consultants and detailmen in relation to most useful source of drug information among personal contacts (Zellmer, 1974; Editorial, J. Amer. Med. Assoc., 1974; Herman & Rodowskas, 1976). Another survey involving specific physician interest in pharmacist drug information services indicated that a large number of physicians were ready to accept reliable drug information being supplied by pharmacists (Hamm et al., 1973). A study on nurses' sources of drug information indicated the Physicians Desk Reference as most frequent source, followed by other nurses, then pharmacists. However, there was a 74-85% affirmative response to the question of supporting greater pharmacy involvement in drug information and continuing education programs (Haymond et al., 1977). The two

physician surveys can be considered as being somewhat representative of physicians' opinion generally, due to the large randomly selected sample sizes. However, the results found by Haymond *et al*. have less validity. The limitations of this study (i.e., the lack of a control group and lack of random selection and assignment of the study sample, plus the fact that the study consisted of only one hospital setting), prevent the results from being generalized to any other nursing group.

Although pharmacists are not the most frequent source of information, the ever-increasing and ever-changing drug literature and multiplicity of drugs available today presents a growing need for immediate access to objective, concise and unbiased information for specific therapeutic problems as they arise (Pellegrino, 1965; Walton, 1967; Gerald, 1968; de Haen, 1970; Naylor, 1971; Blackburn *et al*., 1976).

Many authors have argued that under-utilization is due to the pharmacists' lack of visibility coupled with a general misconception of pharmacists' capabilities (Burkholder, 1974; Rosenberg & Kirschenbaum, 1976). Others have suggested a subjective impression of quality and competence of response as primary to continued use (Troutman, 1975; Ginn & Imoto, 1976; Halbert *et al*., 1977). The lack of formal training in drug information retrieval and in providing relevant clinical drug information is a further problem to overcome. Zilz (1967) suggests two major prerequisites for a successful drug information centre: (1) a pharmacist well trained in all aspects of drug therapy and (2) unification and organization of the available information to ensure accessibility at all times.

The development of drug information services also requires the justification of financial and health care advantages to health care institutions. In this regard, various authors have focused on different aspects. For example, Dreger (1976) points out the difficulty in determining the cost of drug information since its origin varies greatly. Pearson et al. (1970) justifies the need for a drug information service in terms of reducing patient costs through its promotion of rational drug therapy. Parks (1970) and Vance (1973) suggest that a drug information service involving a drug surveillance program is one way of increasing the efficacy and decreasing the cost of drug therapy.

It is clear that the pharmacy profession has difficulty identifying what to assess for the justification process and how to assess it. The majority of pharmacists in practice lack background knowledge concerning the evaluation of services in terms of utilization aspects and impact on health care. Pharmacy curriculum is also generally lacking in material concerning information retrieval skills and communication techniques.

Additionally, sometimes when appropriate criteria are assessed, such as the proportion of questions requiring pharmacist judgement, low evaluations occur. This suggests that some drug information services have not recognized the need to develop an internal system to monitor the caliber of information activity (Grace & Wertheimer, 1975). Thus, the slow development of Pharmacy-based information activities relative to estimated need is not without reason.

Further verification of the haphazard manner in which drug information services have evolved is evidenced by the lack of even one

document identifying the most appropriate method to initiate and evaluate drug information services.

Although the concept of pharmacists providing such a service has received much attention in numerous medical centres in North America, the potential of pharmacists providing a drug information service in small Canadian military medical facilities has not yet been examined. The outcome of this study was thus to serve as a model for examining this potential.

Summary

In this chapter relevant literature has been reviewed in regard to historical development and current status of drug information services.

The literature indicates that the initial development of the DIS concept was a response by the pharmacist to the DI dilemma of the health care team's efforts to remain current with respect to the ever-increasing knowledge of drugs and their use. The DIS concept has subsequently evolved to include many variations in the method of providing a DIS, with no single concept emerging as a standard for this type of pharmacy practice. Studies have also indicated that the DI needs of the health care system as a whole have still not been met, therefore the existence of a DIS in itself has little impact on meeting these DI needs, and other factors play a role in the utilization of such a service.

To date no studies have been performed regarding the utilization of a DIS in a small CFB hospital, therefore the impact of such a service has not been determined in this environment.

In the following chapter, the methods used in the organization of a DIS and the criteria for measuring the impact of this service in a local CFB hospital are presented.

CHAPTER III

METHODOLOGY

Introduction

Two areas of investigation were undertaken in this project. The first was to ascertain the feasibility of establishing a DIS in a typical CFB hospital and the second was to evaluate the short term impact of such a service. The methodology described in this chapter relates to the organization of a DIS and the criteria for measuring the impact of this service.

The first portion of this study (period one) consisted of an assessment of current pharmacy based drug information activity at the CFB Edmonton hospital for a period of two months, and an opinion survey relating to drug information services of both the control and experimental groups prior to the introduction of DIS in Edmonton. It was intended that DI activity at the CFB Calgary hospital would also be assessed for comparative purposes. Due to the absence of all major military units, including the base pharmacist and medical personnel on a military exercise during the study period, the collection of sufficient DI activity data for the control group was not possible.

The principal portion of the study (period two) comprised the operation and collection of DI activity data by the DIS for a further two month period. DI queries received by the DIS served as the primary data source for comparative analysis of DI activity for this study.

Opinions of the control and experimental groups were again assessed at the end of the final week of the study.

Since data collection related to DI activity in period two started just one week after the DIS was implemented, the time interval may have been insufficient for the DIS to become properly established or for the potential novelty of the new DIS to dissipate.

To ensure a high standard of quality in the dissemination of DI, a DIS review committee was formed to monitor the activities and performance of the DIS.

Statistical analyses of the data were performed using the two tailed t-test for two independent samples, paired samples t-test, chi-square and P-Q tests, with a probability level of .05 used as the level of significance. Computations were performed with the aid of the statistical package for the social sciences (SPSS) (Klecka, Nie, & Hull, 1975) or via programmed APL functions.

Organization of a DIS

The DIS office was centrally located in the base hospital at CFB Edmonton midway between the physicians' offices and the pharmacy department. This office location permitted the DIS to operate as a separate entity apart from the normal pharmacy operation and provided a location which was reasonably accessible to all medical staff personnel. The DIS office contained a working table, chair, filing cabinet and telephone with an intercom component. The intercom provided complete internal communcation access between all hospital department offices

and the DIS location. A duplicating machine was also available for replication of drug information material.

The drug literature base for the hospital was assessed by the investigator to determine the usefulness of the available references in providing adequate DI for requests received during period one; subsequently DI references were added to the existing pharmacy library in order to provide DI not previously available and to fully cover the potential of future DI requests. This adjusted literature base, covering a broad range of medical and pharmaceutical subject matter, served as the basis for the DIS library (Appendix I).

Implementation of the DIS consisted of first advising the health care staff of the establishment of a DIS and its relationship to the current pharmacy service (i.e. an extension of present pharmacy service but location in a separate area of the hospital, suggested usefulness of DIS in support of current medical activity).

To facilitate the DIS's capability to provide an effective service, specific activities were introduced by the DI pharmacist for this study: a) two filing systems were implemented, one under a pharmacological classification following the American Hospital Formulary Service, and the other based on disease states following the index of "Current Diagnosis and Treatment" by Krupp (1976); b) the five step approach to answering DI requests as outlined by Watanabe et al. (1975) was utilized; c) an "Aid in locating the reference source of choice" (Appendix II) was used as a guide in choosing appropriate general reference sources (Merritt, Garnett and Eckel, 1977).

To promote the health care team's awareness of the DIS, a weekly newsletter was published and the DIS pharmacist's participation in the physicians' inservice education program was initiated.

The fact that the DIS pharmacist was a senior military officer could have presented a possible negative or positive influence on potential users of the DIS. In an effort to keep this possible source of invalidity to a minimum, the status and presence of the DIS pharmacist was explained to all staff members in terms of his being a student involved in a university project. Additionally, while at the base hospital, civilian attire was always worn and activities were primarily confined to the DIS office.

Impact of DIS

The principal measures for impact of the DIS were: (a) changes in opinion by physicians and nurses in relation to drug information services; (b) assessment of changes in DI activity; and (c) evaluation of the quality of DI service provided.

Opinions of physicians and nurses

Subjects for this study included all physicians and nurses at CFB Calgary and CFB Edmonton base hospitals who were designated as the control and experimental groups respectively. The base hospitals at CFB Calgary and CFB Edmonton were selected as proposed sites for carrying out this project due to their many similarities and were assumed to be typical

small military base hospitals. Similarities between the two CFB hospitals included the nature of medical practice, location in relation to major urban centres, populations served, staffing patterns and workload statistics (Appendix III). One noted exception, in regard to the control and experimental physician groups was that the CFB Calgary physicians were older and more experienced than the CFB Edmonton physicians.

Both hospitals had small libraries containing a limited range of medical reference textbooks and health care oriented journals, which were available to all members of their respective hospital staff. The pharmacy libraries consisted of the full complement of pharmaceutical manufacturers' catalogues plus selected reference texts. Approval to proceed with this study was obtained from the Base Surgeon and Hospital Administrative Officer at each hospital.

The study design tried to use two relatively similar samples in the hope that an adequate control and experimental group could be obtained. By examining the differences between groups as well as within groups over the experimental period, it was attempted to estimate if DIS had an impact and if some sources of internal validity were present, i.e., history, maturation and testing and estimate if the groups were representative of CFB hospitals. However, since random sampling of groups both for selection and assignment (to ensure representativeness and sampling equivalence of the groups) was not possible, the degree of control was unknown. Besides these weaknesses of the design, statistical power was low because of small sample sizes as previously mentioned in Chapter I (cf. p.4).

The content of the DI questionnaire (Appendix IV) was designed to assess both the time spent by the physicians and nurses in seeking DI and their opinions as to the usefulness of the pharmacist in relation to common alternate DI sources. Changes in opinion as to the usefulness of a pharmacist in relation to alternate DI sources would serve as a possible indicator of the impact of the DIS.

The results of the DI questionnaire were assessed in relation to the physicians and nurses separately, however due to the limitation of the small sample sizes, comparisons were also made with the physicians and nurses combined as a group.

Drug information activity

Drug information queries were recorded by the base hospital pharmacist for a period of two months, utilizing a DI documentation sheet (Appendix V). DI requests were classified into four categories (Appendix VI) by the investigator, based on the nature of request as defined by Pearson (1970). DI requests were also assessed as being either judgemental or nonjudgemental. The following basic definition for judgemental questions was used: "Judgemental questions require the integration of data or knowledge and experience in the process of making a decision regarding a specific therapeutic problem" (Grace & Wertheimer, 1975). This assessment was done by the investigator and it is recognized that there was potential bias or nonrepresentativeness in the judgement of the assessor.

A comparison in the differences of DI activity from period one to period two for the experimental group provided a variety of measures of the impact of the DIS:

a) Changes between frequency of DI activity;

b) Changes in the nature of DI activity (including a shift from pharmaceutical type to pharmacological and therapeutic type questions, and an increase in the number of judgemental questions received); these changes were assumed as indirect evidence of the acceptance of the DIS by the experimental group in terms of its usefulness as a source of DI for more indepth and difficult DI queries;

c) Assessment of the frequency of DI queries in relation to several time intervals (DI queries of the therapeutic and judgemental type took longer to answer, therefore a shift in the number of questions of this type was assumed to be an indirect indication that more indepth questions were asked);

d) Change in the method of contact - a shift to increased personal contact was assumed to be an indirect indication that there was an increased interest in the DIS and its viability as a useful DI source.

Quality of service

The DIS review committee comprised of the investigator's supervisor from the Faculty of Pharmacy, University of Alberta, and the Base Surgeon of the experimental base hospital; both independently evaluated the adequacy of the answers to questions posed to the DIS by all health care personnel in the experimental group. This evaluation was done on

a randomly selected sample of 25 questions utilizing an evaluation form (Appendix VII). The answers to the DI queries were assessed for levels of accuracy, implications of inaccurate information, and relevance of delivered information to the problem. A maximum score of four was possible for each criteria. Each evaluator independently assessed the same 25 questions and their scores were then compared for inter-judge consistency, and if found consistent were then assessed to determine the quality of answers provided by the DIS.

Summary

The purposes of this study were to ascertain the feasibility of establishing a DIS in a local CFB hospital and to evaluate the short term impact of such a service.

The principal instruments for this project were a DI questionnaire used to assess opinions relating to drug information services and a DI documentation sheet used to record DI queries for comparative analysis of DI activity. A quasi research design consisting of presumably two similar base hospitals was utilized to provide comparative measures of the impact of the DIS. The study samples, though limited in terms of size and being arbitrarily selected, consisted of all available nurses and physicians and CFB Calgary and CFB Edmonton base hospitals. These were arbitrarily designated as the control and experimental groups respectively.

The study was of four months duration with each observation period being two months. The DIS was implemented during a one week period

immediately following the end of period one and prior to the beginning of period two. Opinions for each group were assessed during period one and at the end of period two. During period one current pharmacy based DI activity was documented for the CFB Edmonton base hospital only, while for period two, DI activity was documented only for the DIS established at CFB Edmonton.

During the implementation of the DIS, considerable care was taken in: choosing a central, easily accessible location; acquiring adequate drug literature resources for the DIS office; promoting the DIS so that potential impact of these three important criteria on the organization of a DIS could be observed.

Limitations of the study included lack of random selection and assignment for the sample groups; small sample sizes; short duration of the study; and the fact that the DI pharmacist was the researcher as well as a senior military officer.

The results of the data analysis and their interpretation are presented in Chapter IV.

CHAPTER IV

RESULTS AND INTERPRETATION

Introduction

As described in Chapter III, there were two areas of investigation: the feasibility of establishing a DIS in a CFB hospital and the evaluation of the short term impact of such a service. The results of the data analyses for these two areas of concern are reported in this chapter.

Results of DIS Organization

During the organization and operation of the DIS at the base hospital CFB Edmonton, the importance of an accessible location, adequate drug literature resources and effective promotion were observed.

It appeared that the central location of the DIS provided increased accessibility and visibility compared to the previous service, which previously had been isolated at one end of the hospital. The more readily accessible DIS location may have been a contributing factor in any positive impact that the DIS had on the experimental group. The importance of location, accessibility and visibility to the usage of a DIS had been supported in studies by Parker (1965) and Merritt *et al.* (1977).

The resource information literature available to the DIS were found to be more than adequate by the investigator for the DI questions received. Although the DIS resources consisted of several additions to the normal pharmacy library, approximately two-thirds of all questions asked were answered using four reference sources readily available to all CFB pharmacies - Martindales Extra Pharmacopoeia (1977), Compendium of Pharmaceutical Specialties (1978), patient drug profile cards, and the drug literature filing systems.

Utilization of DI aids such as the 'Aid to Best Reference Chart' proved useful as a time saver on several questions. Aids such as this could be useful to a DIS if related to the nature of DI activity and references at the individual DIS where employed.

Results of Impact of DIS

Opinions of Physicians and Nurses

Of the 84 comparisons by t-test done between the control and experimental group means at period one, only three questions were found statistically significant (Tables 1 and 2). The presence of these mean differences between the control and experimental groupsindicated that the base hospitals studied were less similar than originally assumed (cf. p.20), and that results found in the experimental base hospital could not safely be generalized to other CFB hospitals.

Specifically, there was a statistically significant difference between the control and experimental combined groups in terms of the degree to which each group would utilize a physician colleague (Appendix

TABLE 1

Comparison of Control and Experimental Combined Groups for Questions which were Statistically Significant in Either Periods one and Two

		Group				
Question	Period	Control (N=5)	Experimental (N=10)	t	df	p*
q^a	1	1.8	3.2	-2.43	13	.03
	2	2.0	2.7	-0.94	13	.365
q^b	1	1.4	1.0	2.40	13	.03
	2	1.2	1.2	0.0	13	1.0

q^a = question 4.a.3rd choice, Appendix III - "frequency physician colleague utilized for additional DI concerning cost, availability and dosage.

q^b = question 4.d.4th choice Appendix III - "frequency pharmaceutical manufacturer's representative utilized for additional DI concerning patient specific therapeutic problem.

*p = probability of t under null hypothesis

TABLE 2

Comparison of Control and Experimental Nurse Groups for Questions which were Statistically Significant in Either Periods One and Two

Question	Period	Group Control (N=5)	 Experimental (N=5)	t	df	p*
q^a	1	2.0	1.4	.61	4	.573
	2	3.0	1.2	3.67	4	.02
q^b	1	2.0	4.8	-3.06	4	.038
	2	5.0	5.4	-0.67	4	.541

q^a = question 3.1st choice Appendix III - Means of overall usefulness of a manufacturer's representative as a source of drug information.

q^b = question 4.d.3rd choice Appendix III - Means of frequency physician colleague utilized for additional DI concerning patient specific therapeutic problem.

*_p_ = probability of t under null hypothesis

IV, see question 4.a.3rd choice) - 16 and 44 percent of the time respectively (Table 1). Since there was no significant difference between the control and experimental combined groups at period two, the significant difference observed provided evidence of dissimilarities between the two base hospitals.

In addition, there was a significant difference between the control and experimental combined groups in relation to the frequency each group would utilize a pharmaceutical manufacturers' representative (Appendix IV, see question 4.d.4th choice) - 8 and 0 percent of the time respectively (Table 1). This observed difference provided further evidence of possible dissimilarities between the control and experimental groups. During the two month study period in which the DIS was operated, there were numerous visits to the experimental hospital by pharmaceutical representatives which resulted in group discussion between the pharmaceutical representatives, physicians, nurses and DIS pharmacist. The change in mean by the experimental combined group from no utilization of the pharmaceutical representatives at period one to a small utilization at period two could have been a result of the impact of the numerous visits by the pharmaceutical prepresentatives during the study period.

There was also a statistically significant difference between the control and experimental nurse group means at period one in their utilization of a physician colleague (Appendix IV see question 4.d. 3rd choice) - 20 and 76 percent of the time respectively (Table 2). As previously stated (cf. p.26), this statistically significant difference provides further evidence as to the lack of representativeness of the base hospitals.

Comparison of the control and experimental nurses for period two showed a statistically significant difference in means, 3.0 and 1.2 respectively (Table 2), in relation to overall usefulness of the manufacturer's representative (Appendix IV see question 3. 1st choice). This difference should not be regarded as an indication that the DIS had an impact however. Although there was a statistically nonsignificant decrease in the mean for the experimental group from period one to period two the difference between control nurses and experimental nurses at period two is due mainly to the increase observed in the control nurses between period one and period two. Since the control group did not remain stable, the effects of testing or other sources of invalidity may have been present.

A comparison of the difference of means from period one to period two was conducted for both the experimental and control groups utilizing a paired t-test. None of the changes observed were statistically significant except in the experimental combined group with respect to the utilization of the pharmacist for additional drug information regarding the side effects, contraindications and adverse drug reactions (Appendix IV see question 4.b.2nd choice). In this case mean scores for period one and period two were 2.8 and 3.9 (Table 3). In order to have observed a statistically significant change between period one and period two, the change would have to be large, due to the small numbers in the sample size. Since a statistically significant change was observed for the experimental combined group, and while the fact that the control group did not change from period one to period two on this question, it increases the likelihood that the presence of the DIS was

positive. One must keep in mind, however, that the control and experimental groups were not equivalent in all respects at period one (as previously seen cf. p. 29). Further, since the DI pharmacist was the research investigator, this positive impact of DIS cannot be generalized to any DIS in small CFB hospitals.

TABLE 3

Comparison of Periods One and Two for Question which was Statistically Significant for Experimental Combined Group

Period	n[a]	Mean[b]	t	df	p*
One	10	2.8	-2.40	9	.04
Two	10	3.9			

[a] n = number of participants who completed opinion survey for both periods.

Mean[b] = for question 4.b.2nd choice, Appendix III - "frequency pharmacist colleagues utilized for addyl DI concerning SE, Contraindications, adverse reactions".

*p = probability of t under null hypothesis

Results of DI Activity

Due to unpredictable circumstances (cf. p. 16) no DI activity data were available for the CFB Calgary hospital, therefore results presented refer to the DI activity at the CFB Edmonton base hospital only. Thus, no estimate can be made as to presence of sources of invalidity in the CFB Edmonton results.

Changes in Frequency of DI Activity. The frequency of DI questions received (classified by content of the question) for periods one and two are shown in Table 4. As indicated there was a statistically significant increase in the frequency of DI activity after the DIS was established.

Table 4

Frequency of DI Requests for Experimental Group for Periods One and two by Classification (% by row; % by column)

Classification	Period One	Period Two
Pharmaceutical	20(40.8; 45.5)	29(59.2; 23.6)
Pharmacological	4(16.0; 9.1)	21(84.0; 17.1)
Therapeutic	16(19.8; 36.4)	65(80.2; 52.8)
Unclassified[a]	4(33.3; 9.1)	8(66.7; 6.5)
Total	44(26.3; 100)	123(73.7; 100)

[a] Unclassified consists of all questions not pertinent to the other three classifications.

X^2_{3df}, = 8.78, p < .03

The results also show an increase in frequency of DI received for each category of contact (Table 5a). There were statistically significant increases from period one to period two in the total number of DI questions received from the physicians, $\underline{z} = -3.37$, $\underline{p} < .001$, nurses, $\underline{z} = -3.95$, $\underline{p} < .001$, and medical assistants, $\underline{z} = -5.303$, $\underline{p} < .001$ (Table 5b).

Table 5a

Frequency of Drug Information Questions by Classification and Category of Contact

Classification	M.O.	Nurse	Med.A.	Pharm	Other[a]	Total
			Period One			
Pharmaceutical	11	1	0	0	8	20
Pharmacological	4	0	0	0	0	4
Therapeutic	7	3	0	0	6	16
Unclassified[b]	0	0	0	0	4	4
Total	22	4	0	0	18	44
			Period Two			
Pharmaceutical	13	8	0	1	7	29
Pharmacological	16	3	1	1	0	21
Therapeutic	21	15	7	6	16	65
Unclassified	2	1	0	0	5	8
Total	52	27	8	8	28	123

[a] Other = DI questions from other than above sources.

[b] Unclassified consists of all questions not pertinent to the other three classifications.

Table 5b

Frequency of Drug Information Requests for Periods One and Two by Category of Contact (% by row)

Category	Period One	Period Two	*Z* Score
Medical Officer	22(43)	52(57)	-3.37*
Nurse	4(13)	27(87)	-3.95*
Medical Assistant	0(0)	8(100)	-5.30*
Total	26(23)	87(77)	

*$p < .05$

The demand for a DIS is a major factor in determining the viability of that service. Results from the assessment of the DI activity, show that the demand for DI increased significantly after the DIS was established. One of the most important reasons for this increased demand was the successful promotion of the DIS. The importance of continuous promotion as a key element in the success of any DIS has been documented by numerous authors (Burkholder, 1965, 1974; Anderson, 1965; Schroeder, 1975). From the comments of the health care personnel at CFB Edmonton the weekly newsletter seemed very successful in stimulating interest in the DIS operation with the drug information articles that were presented. Numerous discussions with the medical staff were generated from newsletter contents and these often led to specific drug information questions. Similar experiences were found by O'Brien (1971), Rosenberg (1971), and DiPirro (1975) when they used a newsletter in their DIS's.

Participation by the DIS pharmacist in the physician inservice education program was another apparent successful method of promotion of the DIS. The inservice education meetings were well attended and provided a means of increased professional contact between the physicians and DIS pharmacist. The active participation by the DIS pharmacist in these meetings allowed an opportunity for him to enhance his credibility as a useful drug information source and contributed to his eventual acceptance in this area. These findings are similar to a report by Burkholder (1974), who reported the use of pharmacist participation in education at the Kansas City Medical Centre as one of the most successful methods of gaining acceptance by other medical personnel.

The promotion and demand for a DIS is often dependent on an increased level of visibility and a high profile by the DIS pharmacist. However, the fact the DIS pharmacist in this study was a senior military officer possibly presented an additional or unique influence on potential users - stimulating either a greater or lessor number of DI questions. Another factor that may have effected a change in DI frequency was the novelty of the new DIS being offered; if present the short term interest would have diminished with time, but this study, as noted, was not carried out long enough to detect such a source of invalidity. Further, without knowing the DI activities of CFB Calgary in period one and period two, it remains possible that some unknown and uncontrolled influence besides or in addition to the DIS was influential in this apparent increase.

Changes in nature of DI activity. Since increase in requests is not a solely important indicator of DIS impact, an examination of the nature of these increased requests is presented in Table 6. The results show there was a statistically significant increase in proportions between the period one and period two in pharmacological and therapeutic categories. The largest number of requests for therapeutic information during period two came from the physicians. This represents a change from period one where the majority of their requests were in the pharmaceutical category. These results may reflect the increased acceptance by the physicians of the capability of the DIS to provide DI substantially more comprehensive than what had been provided by the existing pharmacy service. However, one must keep in mind that since it already has been found that the CFB Edmonton and CFB Calgary physicians were not the same the representativeness of the Edmonton group is called into question. Another interpretation may thus be that the DIS was filling an existing need of the physicians for DI created by their limited experience.

Table 6

Frequency of Drug Information Questions for Each Classification for Experimental Groups (% by row)

Classification	Period One	Period Two	_Z_ Score
Pharmaceutical	20 (40.8)	29 (59.2)	-1.2857
Pharmacological	4 (16.0)	21 (84.0)	-3.2*
Therapeutic	16 (19.8)	65 (80.2)	-5.4*
Unclassified	4 (33.3)	8 (66.7)	-0.866
Total	44 (26.3)	123 (73.3)	

*$p < .05$

In addition to examining the content area of the requests, questions were examined in terms of the degree of judgement required for an answer. The proportion of nonjudgemental and judgemental questions received for periods one and two are shown in Table 7. All the questions asked during period one were of the nonjudgemental type. During period two, there was a statistically significant change, where judgemental questions comprised twenty-five percent of the questions asked.

One criteria for assessing a viable DIS is the number of questions received that require a judgement to be made (Grace et al.,1975). Reciept of this category of question demonstrates a measure of confidence by the person asking the question (i.e., assumes an ability of the DIS to provide more than routine drug information). Approximately 25% of the questions received by the DIS could be classified as judgemental. While Grace et al. (1975) found only 4 - 6% judgemental questions, reports from other centres have ranged from 27% to 53.8% (Troutman, 1975; Steiner, 1975; Ginn, & Imoto, 1976; Lipman, 1976). This variation may be the result of the varying periods in which the DIS's were in operation, (some not having been of sufficient length to establish complete user confidence). Variations in the sample sizes and differences in the nature of medical practice could also be major factors. In general, however, the number of judgemental questions received here in this study compares favorably with other centres and adds support to the evidence that a viable DIS was established and that it had a favorable impact in the CFB Edmonton hospital.

Table 7

Proportions of Nonjudgemental and Judgemental Questions for Periods One and Two (% by column)

Category	Period One	Period Two
Nonjudgemental	44 (100)	92 (74.8)
Judgemental	0	31 (25.2)

Note. Numbers in partntheses indicate the percentage proportion of questions in each category.

$X^2_{1df,} = 13.6230$, $p < .001$

Since the determination of whether or not a question is judgemental is a matter of interpretation and therefore could be suspect, an examination of the time required to answer DI questions was also done. The assumption underlying such an examination is that an increase in the time required to adequately answer a question reflects the degree of difficulty of the quesiton and again indirectly demonstrates the confidence the questioner has in the DIS pharmacist to answer it.

The results show (Table 8) that 93.5% of the questions received could be answered in 30 minutes or less. This represents a figure somewhat higher than those reported by other authors - 78.7% by Pearson (1970) and 74.9% by Merritt (1977). Several possible reasons exist: (1) differences in number of judgemental questions; (2) differences in the nature of the institutions, (e.g., the results of Merritt

and Pearson were from large medical centres, where the potential for a DIS receiving more indepth therapeutic problems is much greater than a base hospital); (3) differences in the time interval DIS was operated which would affect the development of the DI source reaching its full potential; (4) the varying ability of DIS pharmacists in each of the different studies. Regardless of why this study found so many questions which could be answered in less than thirty minutes, the evidence showed that a longer time was required to answer questions posed in period two, again indirectly indicating the hospital staff asked more difficult (i.e., judgemental) questions when the DIS was in effect.

Table 8

Percentage of Drug Information Questions Answered by Each Time Interval (% by col)

Time Interval	Period One[a]	Period Two[b]
Minutes		
< 5	86.4	59.3
5 - 15	13.6	24.4
15 - 30	-	9.8
> 30	-	6.5

[a] *n* = 44 DI questions

[b] *n* = 123 DI questions

Table 9a

Comparison of the Methods of Receiving Drug Information Requests for Periods One and Two (% by row)

Period	Category of Contact	Method	
		Phone	Personal Contact
1	Physician	22 (100)	0
	Nurse	0	4 (100)
	Medical Assistant	0	0
	Other	11 (61.1)	7 (38.9)
	Total	33 (75)	11 (25)
2	Physician	20 (38.5)	32 (61.5)
	Nurse	4 (14.8)	23 (85.2)
	Medical Assistant	1 (12.5)	7 (87.5)
	Pharmacist[c]	0	8 (100)
	Other	9 (32.1)	19 (67.9)
	Total	34 (27.6)	89 (67.9)

Note. Numbers in parenthises are data presented in percentage

[a] *n* = 44 DI requests received by regular pharmacy service which was DI source.

[b] *n* = 123 DI requests received by DIS which was DI source.

[c] Pharmacist refers to base hospital pharmacist.

Since interest in the DIS could be indirectly measured by changes in the user's personal contact with the DIS pharmacist, comparative data on how requests were received during periods one and two were examined (Table 9a). There was a statistically significant decrease from periods one to two in the proportion of DI queries received by phone, $\underline{z} = +3.316$, $\underline{p} < .001$, while a statistically significant increase in proportion was shown for personal contact, $\underline{z} = -4.959$, $\underline{p} < .001$ (Table 9b). The results also show a significant increase in personal contact by all categories of user during period two. During period one, all requests from the physicians were received by phone, while during period two, approximately two-thirds were by personal contact. One reason for this change may be an increased interest in this DIS due to its accessibiltiy and the fact that substantial DI resources were maintained in the DIS office.

The statistically significant increase in opinion noted in Table 3 (experimental combined group attitude towards utilizing a DIS pharmacist more) is supported by the change in frequency the DIS pharmacist was utilized by the combined experimental group. This change is also supported by an evaluation of the descriptions on how the control and experimental groups saw the role of the pharmacist on the health team. Besides a dispenser of medication, subjects from both groups saw the pharmacist as a 'potential' source of DI, especially in the area of side effects, contraindications and adverse drug reactions. Therefore, the significant changes observed between periods one and two for experimental combined group in the frequency they would utilize the pharmacist as an additional source of specialized

Table 9b

Frequency of the Method of Receiving Drug Information Requests for Periods One and Two (% by row)

Period	Phone	Personal Contact	*Z* Score
One	33 (75)	11 (25)	+3.316*
Two	34 (27.6)	89 (72.4)	-4.959*

*$p < .05$

drug information, could be considered valid, and thus supports the feasibility of a DIS through this implied utilization by members of the health care team, at least for one type of DI.

Although the changes in the measures of DI activity suggest a relationship to an impact by the DIS, the limitations of this study suggest the changes may also be attributed to other influences - e.g., the novelty of a new service being offered (which may have generated a short term interest); the status, personality and vested interest of the DIS pharmacist; the brevity of the study; the fact that frequency of DI questions could not be compared to a control group; etc. The results therefore do not necessarily have significance other than for the CFB Edmonton base hospital during the study period.

Quality of Service

The results of the DIS review committee evaluation of 25 randomly selected DI questions are shown in Table 10. An important consideration for the continued usage and demand for a DIS is its ability to provide accurate and appropriate responses to DI requests. The scores assessed by each evaluator were not significantly different indicating some reliability between evaluators. Both evaluators rated all 25 answers at or near maximum adequacy, indicating that both evaluators saw the responses to DI requests by the DIS as being generally accurate and appropriate. This could therefore partially account for the increased usage and demand for the DIS that was found in this study.

Table 10

Mean Score for Each Assessment Criteria
By Review Committee Evaluators

Evaluator	Number of DI Questions	Assessment Criteria[a]			
		1	2[b]	3	4
1	25	3.92	-	3.88	3.48
2	25	3.96	-	3.96	3.64

Note. Each evaluator assessed the same 25 drug information questions

[a] Maximum score attainable for each criteria was 4.0.

[b] No answers were considered applicable to criteria 2.

Summary

Results from this study tended to reinforce the importance of location, adequate literature resources, and promotion on the success of a DIS. There was a suggested possible impact in respect to DIS utilization and the degree of personal contact with the medical staff.

The results of the DI questionnaire, suggested by the change observed between periods one and two for the experimental combined group in relation to pharmacist utilization as a DI source etc., indicates some support through utilization for a DIS. However, some differences were observed between the control and experimental groups, particularly at period one thus calling into question the representativeness of the subjects and the study. Analyses of the data form the DI documentation sheet showed significant changes in both the frequency and nature of DI activity, suggesting a positive impact by the DIS. However, other factors i.e., the fact this investigator was the DIS pharmacist and the effects of this potential reactive influence, the novelty of a new service being provided etc. indicate the changes observed may not necessarily be due to the DIS. Therefore the results are only a tentative indication that the DIS may have had a positive effect in some regards.

The results of the DIS review committee showed that the quality of service provided was generally high in relation to the accuracy and appropriateness of responses to DI requests.

In the final chapter, a summary of the study and recommendations arising from it are presented.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Summary

The vast increases in scientific literature published in the past two decades has placed increasing pressures on the health care team in their efforts to remain current with knowledge of drugs and their use. The literature indicates that pharmacists are attempting to play a role in solving this drug information dilemma through the development of the DIS concept in numerous medical centres in North America.

No studies have been reported in regard to the utilization of a DIS in small CFB hospitals. The DI dilemma however, applies also to the medical staff working in small CFB hospitals and it is anticipated that increasing DIS expectations will be placed on the base hospital pharmacist to expand his drug information role through the development of a relevant DIS. The purposes of this study were to ascertain the feasibility of establishing a drug information service in a local CFB hospital and to evaluate the short term impact of such a service.

The principal instruments for this project were a DI questionnaire used to assess opinions relating to drug information services and a DI documentation sheet used to record DI queries for comparative analysis of DI activity. A quasi experimental research design utilizing two presumably similar base hospitals was used to provide comparative measures of the impact of the DIS. The study samples consisted of all nurses and

physicians at CFB Calgary and CFB Edmonton base hospitals, which were designated as the control and experimental groups respectively.

The study consisted of two observation periods, each of two months duration. The DIS was implemented during a one week period immediately following the end of period one and prior to the beginning of period two.

During implementation special consideration was placed on DIS location, drug literature resources and promotion, in order that the potential impact of these three important criteria on the organization of a DIS might be observed. Opinions for each group were assessed at the end of periods one and two. During period one current pharmacy based DI activity was documented for the base hospital CFB Edmonton only, while for period two, DI activity was documented only for the DIS established at CFB Edmonton.

Results from this study provided limited evidence that location, drug literature resources and promotion, may have had some impact on DIS utilization and the degree of personal contact with the medical staff. The results of the DI questionnaire suggested an observed change for the experimental combined group in relation to pharmacist utilization as a DI source, indicates some support through utilization for a DIS. Other differences observed called into question the representativeness of the two sample groups. Analysis of the data from the DI documentation sheets showed significant changes in both the frequency and nature of DI activity, suggesting a positive impact from the DIS. The results also showed that the DIS service provided was generally of a high quality and there-

fore could have partially accounted for the increased usage and demand for the DIS in this study.

Limitations of this study included the apparent differences between the sample groups, the small sample sizes, the brevity of the study, the lack of a control group for comparable DI activity, and the potential unique influence of the DI pharmacist. These limitations prevented any generalization of the study results to any other small CFB hospitals. The limitations also prevented any definite conclusions related to the long term impact of an operating DIS in the experimental hospital.

Recommendations

One of the recommendations from this study is that the current pharmacy service should expand the proportion of time spent on DI activities in an effort to meet the drug information requirements of the health care personnel. It is further recommended that the base pharmacist should initiate a study within the pharmacy department in order to ascertain the implications of an increased DI role in relation to current responsibilities. The study design should provide information as to the extent of DI capability and necessary changes required to effectively meet this expanded role.

The number of limitations present suggest the need for another study to re-evaluate the viability of drug information services for other CFB hospitals. A future study should involve several randomly selected base hospitals. This would provide a measure of representa-

tiveness as to type of military population served and the nature of medical practice. The methodology presented in this study could be used as a model. Each DIS should be established and operated as part of an expanded pharmacy service by the regular base pharmacist. Having the regular pharmacist perform the DIS function, would serve to decrease the interaction resulting form the presence of an external DIS pharmacist. Comparison of the results acquired from each hospital, would provide a degree of generalization in relation to the methodology of organization and impact which might be expected in relation to a DIS.

The establishment and operation of a DIS in a base hospital proved valuable in understanding the drug information needs of the health care staff and how these needs could be met. Although small libraries were available in this study, they generally contain reference texts which were old and outdated, providing the practitioners with little useful drug information as it related to their practice. The pharmacist was generally not perceived or utilized as a DI source for other than pharmaceutical information. This may have related back to the pharmacist's tradiitonal primary role in medical supply and the general lack of demonstrated activity as a viable DI source. In many instances, this could have been attributed to a lack of competence and general inability, perceived or real of the base pharmacist to function as a relevant drug information source.

An implication of this study was the continuing increase in requests for drug information by both the physicians and nurses at the CFB hospital, Edmonton, which was stimulated by the presence and activity of the

DIS. This demand has been due, in part, to the result of an increased awareness of the DI capabilities of the pharmacist and has placed an expectation on the current pharmacy service to increase its involvement in the drug information area. Despite the shortcomings of this study, it is the view of this investigator that similar expectations could occur at other small CFB hosptials if the DIS concept were to be implemented. These DIS expectations may especially be applicable in relation to CF airforce bases where the CFB hospitals are staffed with junior medical officers with limited drug information experience, similar to the experimental hospital at CFB Edmonton.

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APPENDIX I

Drug Literature Base - DIS

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APPENDIX II

Aid in Locating Reference of Choice

(Merritt, Garnett and Eckel, 1977)

INFORMATION SOURCE

Category of questions of information requested	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
General	5	5	5	2	5		5	5									5	
Dosage	2	3		1				4				2	5		3	5	3	3
Side Effects and/or Contraindications	2	3	5	2				2		1	4	3		3	3	5	5	
Therapeutic Use	2	5		2				1			3	2	4		3		3	3
Availability	5	1	4	2														2
Adverse Reactions	5	5		2				3		1	5	3		3	4	5	4	
Therapeutic Compatibility	3					1		1		2		2			4			
Pharmaceutical Compatibility	3			1			2											3
Identification		1	3	2														
O.T.C. Products		5		4	1													
Toxicity	3			1				4	2	1		5		3	5	3	5	
Metabolism	3			2				1				3			4		5	
Other	5			3				4										

* Number indicates information source shown below.
** Best choices are ranked 1-5 in descending order based on evaluation of each information source.

1. American Hospital Formulary Service
2. Compendium of Pharmaceuticals & Specialties
3. Company Catalogues
4. Extra Pharmacopoeia
5. Handbook of Non-prescription Drugs
6. Drug Interactions - Hansten
7. Husa's Pharmaceutical Dispensing
8. Pharmacological Basis for Therapeutics
9. Handbook of Poisoning - Lange
10. Side Effects of Drugs - Meyler
11. Clinical Pharmacology - Melman & Merrelli
12. Applied Therapeutics for Clinical Pharmacists
13. Current Diagnosis & Treatment - Krupp
14. Clin-Alert
15. The Medical Letter
16. Principles of Internal Medicine - Harrison's
17. Manual of Medical Therapeutics - Smith
18. Parenteral Drug Information Guide

APPENDIX III

Comparison of Staffing and Workload Data

	Base Hospital	
	CFB Edmonton	CFB Calgary
Staffing		
Total health care personnel	44	34
Physicians	5	5
Nurses	7	2
Medical Assistants	10	17
Pharmacist	1	1
Supply Technician	1	1
Average monthly patient workload		
Patient beds occupied	69	72
Outpatient clinic	837	453
Average pharmacy prescription workload		
Inpatient prescriptions	190	132
Outpatient prescriptions	1,417	1,382

APPENDIX IV

Drug Information Questionnaire

Please mark the numerical value corresponding to your opinion of each of the following questions. Your first impressions are important and we would ask you to be candid. All questionnaires will remain confidential.

1. Percent of time spent keeping informed on drug information:

   0% 10% 20% 30% 40% 50%

   Is this satisfactory to keep you current in knowledge re drug therapy?

   _________ yes _______ no

2. In your daily practice, for what percentage of patients would you utilize a drug specialist if the specialist were readily accessible?

   0% 10% 20% 30% 40% 50%

   For the next two questions please use the following scale:

   1. approximately 0% of the time
   2. approximately 20% of the time
   3. approximately 40% of the time
   4. approximately 60% of the time
   5. approximately 80% of the time
   6. approximately 100% of the time

3. Rate the overall usefulness of each of the following as a source of drug information for you.

Manufacturer's Representatives	1	2	3	4	5	6
Nurse	1	2	3	4	5	6
Physician	1	2	3	4	5	6
Pharmacist	1	2	3	4	5	6
Textbooks	1	2	3	4	5	6

4. Estimate the frequency with which you contact the sources listed, when additional information concerning a drug or drug product in the following categories is required.

   a) Cost, availability, dosage:

   _____ a nurse colleage
   _____ a pharmacist colleague
   _____ a physician colleage
   _____ a pharmaceutical manufacturer's rep.
   _____ textbooks

b) Side effects, contraindications, adverse reactions:

_____ a nurse colleague
_____ a pharmacist colleage
_____ a physician colleage
_____ a pharmaceutical manufacturer's representative
_____ textbooks

c) General information (ie. pharmacology, metabolism, excretion, indication):

_____ a nurse colleage
_____ a pharmacist colleague
_____ a physician colleague
_____ a pharmaceutical manufacturer's representative
_____ textbooks

d) Patient specific therapeutic problem:

_____ a nurse colleague
_____ a pharmacist colleague
_____ a physician colleague
_____ a pharmaceutical manufacturer's representative
_____ textbooks

5. Please briefly describe what you see as the role of the Pharmacist on the "health team" that would best meet your needs in caring for your patients:

____
____
____
____
____
____

APPENDIX V

PHARMACY & DRUG INFORMATION SERVICE REQUEST FORM

Date ________
Time ________

Requestor's Name ____________
Telephone Number ____________

Request Received: (1) ___ Phone (2) ___ Mail (3) ___ Personal Contact (4) ___ Other ____________

Request Location: (1) ___ Internal (2) ___ External

Category of Contact:

(1) ___ M.D.
(2) ___ Nurse
(3) ___ Med. A.
(4) ___ Pharmacist
(5) ___ Other (specify) ______

Nature of Request:

(1) ___ Administration
(2) ___ Adverse Reactions
(3) ___ Availability
(4) ___ Cost
(5) ___ Dosage
(6) ___ General Pharmacology
(7) ___ Identification
(8) ___ Metabolism
(9) ___ Patient Rx Information
(10) ___ Pharmaceutical Compatability
(11) ___ Side Effects and/or Contraindication
(12) ___ Therapeutic Use
(13) ___ Therapeutic Compatibility
(14) ___ Therapy (Consultation)
(15) ___ Toxicity
(16) ___ Other ____________

Information Requested:

Answer:

References Used:

(1) ________________
(2) ________________
(3) ________________

Time to answer:

(1) ___ 0 - 5 min.
(2) ___ 5 - 15 min.
(3) ___ 15-30 min.
(4) ___ other

Disposition: Time ______ a.m., p.m. Date ________ By ____________

(1) ___ Personal Contact
(2) ___ Phone Call
(3) ___ Requestor Returned Call
(4) ___ Written Reply
(5) ___ Information Not Available
(6) ___ Other ____________

APPENDIX VI

(Adapted from Merritt, Garnett & Eckel; Amer. J. Hosp. Pharm., 1977)

Classification of Drug Information Requests by Category

A. Pharmaceutical
   1. Administration
   2. Availability
   3. Cost
   4. Identification
   5. Pharmaceutical Compatibility

B. Pharmacological
   1. Adverse Reactions
   2. Dosage
   3. General Pharmacology
   4. Metabolism
   5. Side Effects and/or Contraindications
   6. Toxicity

C. Therapeutic
   1. Patient Prescription Information
   2. Therapeutic Use
   3. Therapeutic Compatibility
   4. Therapy (Consultation)

D. Unclassified

APPENDIX VII

Drug Information Services Review Committee Evaluation Form for Answers to Randomly Selected Questions

Question No. __________

I. Accuracy of delivered information

1	2	3	4
all points inaccurate	majority of points inaccurate	majority of points accurate	all points accurate

II. Implications of Inaccurate Information

1	2	3	4
definitely clinically significant	probably clinically	possibly clinically significant	definitely not clinically

III. Relevance of Delivered Information to Problem (Errors of commission)

1	2	3	4
all points presented are irrelevant	majority of points presented are irrelevant to problem	majority of points presented are relevant to problem	all points presented are relevant to problem

IV. Relevance of Delivered Information to Problem (Errors of omission)

1	2	3	4
all aspects of the problem have been ignored	minority	majority	all aspects of the problem have been covered